clear and unequivocal. The surface soil presents a continuous furrow generally several feet wide with transverse cracks which show very plainly the effort of torsion within the zone of the movement. All fences, roads, stream courses, pipe lines, dams, conduits, and property lines which cross the rift are dislocated. The amount of dislocation varies. In several instances observed it does not exceed 6 feet. A more common measurement is 8 feet to 10 feet. In some cases as much as 15 feet or 16 feet of horizontal displacement has been observed, while in one case a roadway was found to have been differentially moved 20 feet. Probably the mean value for the amount of horizontal displacement along the rift line is about 10 feet, and the variations from this are due to local causes, such as drag of the mantle of soil upon the rocks, or the excessive movement of soft incoherent deposits. Besides this general horizontal displacement of about 10 feet, there is observable in Sonoma and Mendocino counties a differential vertical movement not exceeding 4 feet, so far as at present known, whereby the south-west side of the rift was raised relatively to the north-east side, so as to present a low scarp facing the north-east. This vertical movement diminishes to the south-east along the rift line, and in San Mateo County is scarcely, if at all, observable. Still farther south there are suggestions that this movement may have been in the reverse direction, but this needs further field study.

As a consequence of the movement, it is probable that the latitudes and longitudes of all points in the Coast Ranges have been permanently changed a few feet, and that the stations occupied by the Coast and Geodetic Survey in their triangulation work have been changed in position. It is hoped that a reoccupation of some of these stations by the Coast and Geodetic Survey may contribute data to the final estimate of the amount of movement.

The great length of the rift upon which movement has occurred makes this earthquake unique. Such length implies great depth of rupture, and the study of the question of depth will, it is believed, contribute much to current geophysical conceptions.

The time of the beginning of the earthquake as recorded in the observatory at Berkeley was 5h. 12m. 6s. a.m., Pacific standard time. The end of the shock was 5h. 13m. 11s. a.m., the duration being 1m. 5s. Within an hour of the main shock twelve minor shocks were observed by Mr. S. Albrecht, of the observatory, and their time accurately noted. Before 6h. 52m. p.m. of the same day thirty-one shocks were noted in addition to the main disturbance. These minor shocks continued for many days after April 18, and in this respect the earthquake accords in behaviour with other notable earthquakes in the past. The minor shocks which succeed the main one are interpreted generally as due to subordinate adjustments of the earth's crust in the tendency to reach equilibrium after the chief movement.

The destructive effects of the earthquake are in the main distributed with reference to the line of rift. The exact limits of the area of destruction have not yet been mapped, but it is known to extend out about twenty-five or possibly thirty miles on either side of the rift. On the south-west side the greater part of this area to the north of the Golden Gate lies in the Pacific. This area extends from Eureka, in Humboldt County, to the southern extremity of Fresno County, a distance of about 400 miles.

Beyond this area of destructive shock the earthquake was felt in its milder manifestations over a wide territory. Our reports to date show that it was felt in Oregon as far north as Coos Bay, and on the south as far as Los Angeles. To the east it was felt over the greater part of middle California and eastern Nevada, particularly along the eastern flank of the Sierra Nevada. It was felt at Lovelocks, and we have unconfirmed reports of its having been felt at Winnemucca. Far beyond the region within which it was apparent to the senses, however, the earth wave was propagated both through the earth and around its periphery, and some of the most valuable and most accurate records of the disturbance which we have are those which were registered at such distant seismographic stations as Washington, D.C.; Sitka, Alaska; Potsdam, Germany; and Tokyo, Japan.

Within the area of destructive effects, approximately 400 miles by 50 miles in extent, the intensity varied greatly. There was a maximum immediately on the rift line. Water pipes, conduits, and bridges crossing this line were rent asunder. Trees were uprooted and thrown to the ground in large numbers. Some trees were snapped off, leaving their stumps standing, and others were split from the roots up. Buildings and other structures were in general violently thrown and otherwise wrecked, though some escaped with but slight damage. Fissures opened in the earth and closed again, and in one case reported a cow was engulfed. A second line of maximum destruction lies along the floor of the valley system of which the Bay of San Francisco is the most notable feature, and particularly in the Santa Rosa and Santa Clara valleys. Santa Rosa, situated twenty miles from the rift, was the most severely shaken town in the State, and suffered the greatest disaster relatively to its population and extent. Healdsburg suffered to a nearly similar degree. San José, situated thirteen miles, and Agnews, about twelve miles, from the rift, are next in the order of severity. Stanford University, seven miles from the rift, is probably to be placed in the same category. All of these places are situated on the valley floor, and are underlain to a considerable depth by loose or but slightly coherent geological formations, and their position strongly suggests that the earth waves as propagated by such formations are much more destructive than the waves which are propagated by the firmer and highly elastic rocks of the adjoining hill lands.

One of the lessons of the earthquake which seems peculiarly impressive is the necessity for studying carefully the site of proposed costly public buildings where large numbers of people are likely to be congregated. In so far as possible such sites should be selected on slopes upon which sound rock foundation can be reached. It is probably in large measure due to the fact of their having such a rock foundation that the buildings of the State University, at Berkeley, escaped practically uninjured.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

PROF. DOELTZ, privatdocent for metallurgy in the Bergakademie in Klausthal, has been appointed professor of metallurgy in the Charlottenburg Technical High School in succession to Geheimrat Weeren, and will enter on his new duties on October 1.

THE council of the University of Birmingham has approved of a scheme for the foundation of a department of economic zoology, and has appointed Mr. Walter E. Collinge the special lecturer on that subject. By this arrangement, Mr. Collinge will vacate his lectureship in zoology and comparative anatomy, and take over the new department at premises at present being fitted up at 55 Newhall Street. These comprise an inquiry office, consultation room, research laboratory, and museum.

ONE of the most satisfactory features of American university education is the keen interest shown by old students in their respective colleges. We learn from *Science* that at the recent alumni meeting at Harvard University it was stated that during the year graduates had contributed about 360,310*l.* to the productive funds of the University, and that 17,623*l.* had been received for immediate use. This sum does not include the more than 22,600*l.* that the class of one year has given to the University to be used as the corporation sees fit. An anonymous gift of 12,000*l.* from a graduate was also announced. Another instance of the same enthusiasm is shown by President Hadley's announcement at the Yale alumni dinner that the total of the alumni fund for the year amounted to 25,847*l.*, as compared with the 10,700*l.* announced a year ago. From our contemporary we also learn that a fund of 30,000*l.*, of which Mr. Carnegie contributed 15,000*l.*, has been raised at Amherst College, and will be used to provide for the work in geology and biology. Mrs. Louisa N. Bullard, too, has given Harvard University Medical School 10,400*l.* to establish a chair of neuropathology.

MR. HALDANE, Secretary of State for War, distributed the prizes on July 13 to the students and nursing pro-

bationers of the London Hospital and Medical College. During the course of an address he delivered subsequently, he said the surgeon, the physician, the nurse, require science to-day in a way in which they never required it before, and science has influenced and affected profoundly their whole teaching. That is why the standards of a generation ago are no good to us, and why any dealing, not merely with the physical organism, but with the great organism of the community, is so much more difficult and far-reaching than used to be the case. Those who are responsible for dealing with the organisation of society know, or ought to know, that unless they have clear principles and plain ends before their minds they can make no advance, and they require economic science, and legislative science, and science of different kinds before they can get those views in a definite fashion. They would do well, Mr. Haldane continued, to take a lesson from the science of medicine, which has taught that the healing of the body is absolutely dependent on the understanding of the principles upon which life is governed. There are new ideas which penetrate deeper and deeper as year succeeds year. To-day we know that science is the guiding star of work. It is in such men and women as those studying in medical colleges that we have the hope of the future, the security that the story of our race may yet be a story of progress, and that in the generation to come we may see yet a higher state of things realised than even that which we have realised at the beginning of the twentieth century.

THE new buildings of Armstrong College, Newcastle-on-Tyne, described in NATURE of July 5 (p. 232), were opened by the King, who was accompanied by Queen Alexandra, on July 11, in the presence of a large and representative assembly. Addresses to the King were presented by the governors and council of the college, the professors, and the students. In the first-named the president referred to the electrical engineering laboratories, and stated that it is desired to bring this department to as high a level as that of the mechanical engineering of which the college is so justly proud. The liberality of the shipbuilders of the district, it was added, is now being exercised in the establishment of a school of naval architecture befitting the north-east coast as one of the chief seats in the world of the shipbuilding industry. In the course of his replies, the King expressed his admiration of the magnificent buildings; he commended the wisdom of adapting the teaching of the college to the practical needs of the students, and, in mentioning the name of Armstrong as identified with scientific discovery and industrial success, stated that scientific principles are now more than ever necessary for the mental training of all who hope for success in the great engineering works for which Newcastle is famous all the world over. The Earl of Carlisle presented the Queen with a casket made on the premises by the Newcastle Handicrafts Company, a practical offshoot of the art department of the college. Afterwards the Dean of Durham and Mrs. Kitchin, Sir Isambard and Lady Owen, attended their Majesties in a visit to the electrical engineering laboratory, where Prof. Thornton had arranged several interesting demonstrations.

THE summer meeting of the Association of Technical Institutions was opened at Oxford on July 13, with Sir William Anson, president, in the chair. In his presidential address, Sir William Anson said technical associations are comparatively new in our educational system, and an increasing endeavour should be made to accommodate the old to the new, and to find a place for that which is new without dispossessing the old, where that which is old is not worn out, where it combines, as the ancient universities combine, vitality and the promise of the future with the stability which comes of great traditions drawn from the past. The two elder universities are sometimes thought, Sir William Anson continued, to be aloof from the activities of modern life, and Oxford perhaps more so than Cambridge, because of the devotion which Cambridge has always shown to mathematics. Though a university may legitimately specialise in the direction of certain studies, where it can develop those studies in close contact with the operation to which scientific investigation is applied, it ought never to forgo the general scientific teaching which is an essential feature of a university course. What is the relation of the universities to the work of the technical institutes, which, in one form or another, form such a prominent feature in the educational system of municipalities? Sir William Anson thinks it is twofold. In the lower stages the schools of science and technical institutes attended by boys may give such a training as will qualify for scholarships at the universities, and the universities, being thus the goal of the technical institute in its more rudimentary form, should be the starting-point for technology in its more advanced form. The man of science may make discoveries which others may utilise, but the student, if not a man of action himself, helps and befriends the man of action, and technology, if it is to go on advancing, must go hand in hand with those studies which every university, however situated, is able to promote.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, July 2.—M. H. Poincaré in the chair.—An addition to the notes of May 21 and June 11 relating to the discontinuity of the specific heats of fluids: E. H. **Amagat.**—The action of sulphuretted hydrogen on some oxides. Applications to volcanic phenomena and hot springs: Armand **Gautier.** At a white heat, sulphuretted hydrogen reacts with both the magnetic oxide and peroxide of iron, giving iron sulphide and a mixture of hydrogen and sulphur dioxide. A small quantity of sulphuric acid is formed simultaneously, even when oxygen is absent. With alumina, sulphuretted hydrogen gives an oxysulphide of aluminium, together with a mixture of the same gases as above. Sulphuretted hydrogen and carbon dioxide at a red heat give carbon oxysulphide, water, carbon monoxide, and hydrogen, the reaction being the same whether the gases are initially dry or wet. The bearing of these experiments on the composition of volcanic gases is pointed out.—The lava produced by the recent eruption of Vesuvius: A. **Lacroix.** The general phenomena characterising the recent eruption have been described in earlier papers; in the present note the composition of the products corresponding to each phase of the eruption has been studied.—The earthquake in California according to the preliminary official report: A. **de Lapparent.** The evidence is distinctly against the view which has been put forward that there is any connection between the earthquake and volcanic phenomena. The Californian earthquake was essentially an orogenic phenomenon, there being signs of dislocation for a distance of more than 600 kilometres along the Californian coast. The connection between the damage done to buildings and the nature of the soil upon which they were built has also been clearly brought out by the preliminary investigations.—Some synthetical reactions of pinacoline: Louis **Henry.** A study of the products of the reactions between pinacoline and magnesium-methyl bromide and hydrocyanic acid. Both the reactions are normal.—Families of Lamé with plane trajectories, the planes passing through a fixed point: S. **Carrus.**—H. C. Vogel was elected a correspondant for the section of astronomy in the place of the late Prof. Langley.—The classification of irrationals: Ed. **Maillet.**—Researches on armoured concrete and the influence of the removal of the charge: F. **Schüle.**—The influence of surface tension on the propagation of waves parallel to the surface of a liquid plate: M. **Alliaume.**—An optical arrangement generalising the use of the telescope of 1 metre diameter at the Observatory of Meudon: G. **Millochau.** The arrangement consists of an objective of three divergent lenses, placed between the telescope mirror and its focus. By varying the position of the lenses, images can be obtained having the dimensions of those which would be produced by a mirror of a metre diameter and a focal distance capable of variation from 15 metres to 25 metres.—The colorations of fringes localised in a thin plate limited by a grating: Georges **Meslin.**—Phosphorus chloronitride: MM. **Besson** and **Rosset.** An advantageous method of preparing this substance is described, and details given of its reactions with